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THE DEVELOPMENT OF A HIGH AVERAGE POWER GLASS LASER SOURCE.(U)
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NRL CONTRACT N0001481-C-2376

The Development Of A High Average Power Glass Laser Source

Progress Report

July 31, 1981

Prepared by:

John D. Myers
Kigre, Inc.
Toledo, OH

Subject: NRL Contract N00014-81-C-2376

Reference: An Unsolicited Proposal for the Development of a High Average Power Glass Laser Source

Work on the subject contract began on July 13, 1981. The initial efforts pertaining to each task as outlined in the referenced proposal are described as follows:

Task 1; Q-100 Property Measurements

The optical and thermo-optic properties of Q-100 laser glass are to be measured by NBS. Sample specifications deemed necessary by NBS personnel to perform the prescribed measurements are being worked out. The necessary samples will be fabricated and delivered to NBS at their request.

Task 2; The Cladding of Q-100

Final bids are being collected prior to the placing of purchase orders for the cladding equipment necessary to accomplish this task. Facilities-planning and engineering required to house the out-sized redraw machine and honing facility is also underway.

Task 3; Selective Filtering And/Or Energy Transfer to Reduce Thermal Loading

The filter development progress has begun with the melting of our filter base material with and without the addition of several interesting rare-earth-ion dopants. Initial experiments were conducted to determine the anti-solarization properties of the base material and the effect of each of the candidate ions. In this regard, the following melts are tabulated.

Glass Type	Ion	Remarks
KF-2	base	Non-solarizing
L-317	5% Eu_2O_3	Slightly solarized
L-318	5% Tb_2O_3	Solarized
L-319	10% Tb_2O_3	Solarized
KSF-10	10% Sm_2O_3	Non-solarizing
KSF-5	5% Sm_2O_3	Non-solarizing

The solarizing tests were accomplished by fabricating a polished laser rod shape of each of the melts and subjecting the sample to up to 10,000 flashes in a water-cooled laser system. The ultra-violet radiation radiated by the flashlamp in this test is sufficient to solarize any solarizable glass. As a result of these tests plus spectrophotometric measurements, it was concluded that the KF-2 base material was a superior host for the candidate rare-earth ions for the following reasons:

1. KF-2 is a non-solarizing glass
2. KF-2 is essentially non-absorbing from 340nm in the UV to 2750nm in the near IR.

In addition to measuring the absorbtion of the aforementioned samples, spectra was obtain on 31 other glass samples doped with various rare-earth ions and ion combinations. These spectrum plus other datum are necessary to permit the development of the desired filter characteristics. (It is intended to first tailor a filter glass to absorb the unwanted flashlamp radiation....and then selectively dope that glass to promote energy transfer)

Task 4; Glass Strengthening

Our first choice of a method of accomplishing this task is to develop a cladding glass capable of being strengthened. This effort is intimately connected with the cladding task and is the subject of a literature search at this time.

Task 5; Alternate Pump Sources

Nothing has been done on this task.